Model based evaluation of cover crops for banana cropping systems

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There is actually a surge for reintroducing biodiversity in agricultural systems in order to reduce chemical inputs, suppress pests, and close biogeochemical cycles. The use of cover-crops is a promising way to reintroduce biodiversity into the fields. Cover-crops have the potential to decrease chemical use against weeds (by competition) and pests (by increasing in natural enemies). To decrease herbicide use, suitable plants must be able to grow in appropriate conditions, to do not compete the cultivated crop for nutrients or water, but should compete weeds for light and space. There is a trade-off between these objectives. Banana is a semi-perennial crop, each plant develops at its own rhythm leading to an unsynchronized plant population in three years; canopy and nitrogen demand of the crop follow this unsynchronized pattern. Banana cropping systems remain based on bare soil management and a large amount of herbicides is used. In tropical environment, the growth of weeds and cover-crop is complex because it is not constrained by seasons; a constant growth is possible due to relatively constant climate. In these conditions, variation in radiation due to canopy closure is one of the major drivers of their growth. We developed a model based method to assess the suitability of cover crop for a given cropping system context. This method first relies on early measurements of cover crop performed on the field. Then, we used a simulation model to contextualize the growth of cover crops and to assess their capacity to control weeds, to compete the cultivated plant, and to sustain on the long term under the shade of the main crop. This approach allows an early selection of cover crops that should be tested in real intercropping in the field. We present results of this evaluation for 11 species intended to banana intercropping.